How deep should the hole be for a heat-set insert?

Asked 3D Content Team
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Abstract. Insert length and minimum blind-hole depth for M2 to M5 heat-set inserts, standard, short and Voron, from the Ruthex and CNC Kitchen size tables.

Keywords: heat-set-inserts, threads-and-fasteners

Table 1. The number

Insert	Ruthex length	Ruthex minimum blind hole	CNC Kitchen length	CNC Kitchen minimum blind hole
M2	4.0 mm	5.0 mm	3.0 mm	4.0 mm
M2.5	5.7 mm	6.7 mm	4.0 mm	5.0 mm
M3 standard	5.7 mm	6.7 mm	5.7 mm	6.7 mm
M3 short	4.0 mm	5.0 mm	3.0 mm	4.0 mm
M3 Voron (5 x 4)	4.0 mm	5.0 mm	4.0 mm	5.0 mm
M4 standard	8.1 mm	9.1 mm	8.1 mm	9.1 mm
M4 short	4.0 mm	5.0 mm	4.0 mm	5.0 mm
M5 standard	9.5 mm	10.5 mm	9.5 mm	10.5 mm
M5 short	5.8 mm	6.8 mm	5.8 mm	6.8 mm

1 How deep should the hole be for a heat-set insert?

Make a blind hole at least 1 mm deeper than the insert: 6.7 mm for the standard 5.7 mm M3, and 5.0 mm for the 4.0 mm Voron M3 and Ruthex M3 short. Ruthex and CNC Kitchen give this rule. The extra depth holds the plastic the insert pushes ahead of it. A through hole needs no extra depth.

1.1 The number

Lengths are from the Ruthex and CNC Kitchen size tables, read 10 October 2026. Each hole depth is that length plus the 1 mm minimum both tables draw for a blind hole. The makers differ on M2, M2.5 and M3 short, so measure the insert you bought before modeling the hole.

SPIROL, a maker of inserts for molded parts, sets the minimum at the insert length plus two thread pitches. The ISO (International Organization for Standardization) coarse pitch is 0.5 mm for M3, 0.7 mm for M4 and 0.8 mm for M5, per Engineering ToolBox's ISO 724 table. That makes 1.0 mm extra for M3, the same as the 1 mm rule, but 1.4 mm for M4 and 1.6 mm for M5. Both rules state a minimum, so for M4 and M5 use the larger figure.

1.2 Why

Heat-set inserts grip because the hole is narrower than the insert. The iron melts the wall, and the knurls drive that plastic outward into their grooves. Some of it also gets pushed down, so a slug of plastic travels ahead of the insert's tip. In a blind hole, that slug needs somewhere to go. CNC Kitchen asks for a blind hole about 1 mm deeper than the insert, and says through holes need be no longer than the insert. In a through hole, the plastic leaves out the back.

If the hole is too shallow, the insert lands on the slug or the floor of the hole before it is flush and stands proud. Pushing harder bulges the boss (the printed column around the hole) or tilts the insert. SPIROL's guide marks both a proud insert and a sunken one as incorrect. Its limit is flush, at most 0.13 mm above the surface. An insert below the surface leaves the mating part clamped against plastic, not brass.

Depth also caps the screw. SPIROL says the screw should never bottom out in the hole, because tightening against the floor jacks the insert out of the plastic. With a blind hole only 1 mm deeper than the insert, keep the screw's thread past the clamped part no longer than the insert. If a longer screw is needed, use a through hole or deepen the hole.

The hole geometry matters as much as the depth. CNC Kitchen asks for a straight hole, not tapered, normally with no chamfer. The diameters per maker are in What hole size does an M3 heat-set insert need?.

1.3 How to check it on your own print

1. Measure the insert's length with calipers. Model the blind hole at that length plus 1 mm, or plus two thread pitches for M4 and M5.
2. After printing, check the depth with the calipers' depth rod. A sagging bridge or squished layers at the end of the hole can rob depth.

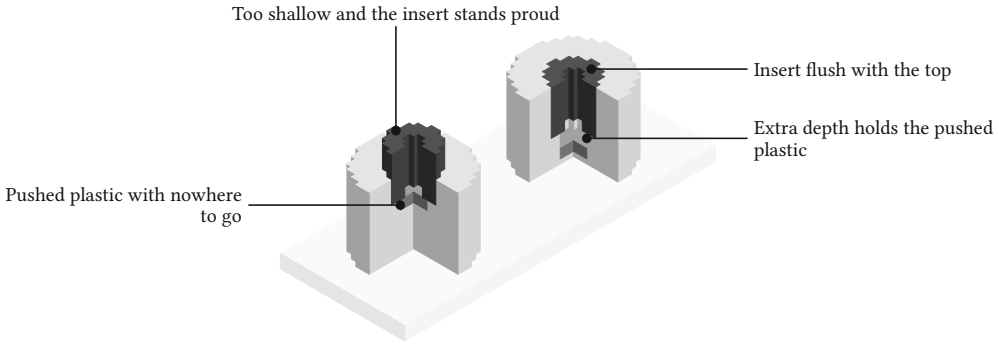


Figure 1. The insert pushes a slug of plastic ahead of it, and only a hole deeper than the insert leaves that plastic somewhere to go.

3. Install with the iron to about 90% of the depth. Finish with a flat tool, and hold it a moment so the insert does not creep back out, as CNC Kitchen advises.
4. Lay a straightedge across the insert: it should sit flush, neither proud nor sunk. On a through hole, check the back for a burr; CNC Kitchen reads a burr there as a sign the hole is still too small.
5. Thread in the screw you will use, by hand. If it stops before the head seats, the screw is bottoming out: shorten it or deepen the hole.

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